

CLAIMS

1. A composition comprising:
 - 1) an elastomer comprising at least 30 mol% of isobutylene;
 - 2) carbon black having a surface area of less than 30 m²/g and a dibutylphthalate oil absorption of less than 80 cm³/100 gm; and
 - 3) polybutene oil having a number average molecular weight greater than 400.
2. The composition of claim 1 where:
 - 1) the elastomer comprises at least 40 mol% of isobutylene;
 - 2) the carbon black has a surface area of less than 25 m²/g and a dibutylphthalate oil absorption of less than 75 cm³/100 gm; and
 - 3) polybutene oil has a number average molecular weight greater than 400.
3. The composition of claim 1 where:
 - 1) the elastomer comprises at least 50 mol% of isobutylene;
 - 2) the carbon black has a surface area of less than 25 m²/g and a dibutylphthalate oil absorption of less than 75 cm³/100 gm; and
 - 3) polybutene oil has a number average molecular weight between 400 and 15,000.
4. The composition of claim 1 where:
 - 1) the elastomer comprises at least 50 mol% of isobutylene;
 - 2) the carbon black has a surface area of less than 25 m²/g and a dibutylphthalate oil absorption of less than 75 cm³/100 gm; and
 - 3) polybutene oil has a number average molecular weight between 700 and 8,000.

5. The composition of claim 1 where the elastomer is present at 20 to 100 phr, the carbon black is present at 10 to 200 phr and the polybutene oil is present at 2 to 40 phr.
6. The composition of claim 1 where the elastomer is present at 20 to 100 phr, the carbon black is present at 20 to 180 phr and the polybutene oil is present at 2 to 30 phr.
7. The composition of claim 1, wherein the elastomer is selected from a halogenated poly(isobutylene-co-alkylstyrene), halogenated star-branched butyl rubber, halogenated butyl rubber, butyl rubber, and mixtures thereof.
8. The composition of claim 1, also comprising a thermoplastic polymer.
9. The composition of claim 1, wherein the polybutene has a number average molecular weight between 400 and 10,000.
10. The composition of claim 1, wherein the polybutene is present from 2 to 40 phr.
11. The composition of claim 1, further comprising one or more filler components selected from calcium carbonate, clay, mica, silica and silicates, talc, titanium dioxide, starch, wood flower, carbon black having a surface area greater than $30 \text{ m}^2/\text{gm}$, carbon black having a dibutylphthalate oil absorption of more than $80 \text{ cm}^3/100 \text{ gm}$, and carbon black having a surface area of more than $30 \text{ m}^2/\text{g}$ and a dibutylphthalate oil absorption of more than $80 \text{ cm}^3/100 \text{ gm}$.
12. The composition of claim 1, wherein the composition also includes an exfoliated clay selected from exfoliated natural or synthetic

montmorillonite, nontronite, beidellite, volkonskoite, laponite, hectorite, saponite, sauconite, magadite, kenyaite, stevensite, vermiculite, halloysite, aluminate oxides, hydrotalcite, and mixtures thereof.

13. An innerliner for a tire comprising the composition of claim 1.
14. An innertube for a tire comprising the composition of claim 1.
15. The composition of claim 1 further comprising one or more carbon blacks having a surface area of greater than $30 \text{ m}^2/\text{g}$ and/or a dibutylphthalate oil absorption of greater than $80 \text{ cm}^3/100 \text{ gm}$.
16. The composition of claim 1 where the elastomer comprises star branched butyl rubber.
17. The composition of claim 1 where the elastomer comprises halogenated butyl rubber.
18. The composition of claim 1 further comprising naphthenic processing oil.
19. The composition of claim 1 where the polybutene oil comprises a copolymer of butene derived units and one or more olefin derived units having from 3 to 8 carbon atoms.
20. The composition of claim 1 where the polybutene oil comprises a homopolymer or copolymer of a C_4 raffinate.
21. The composition of claim 1 where the polybutene oil comprises a homopolymer of isobutylene, or a copolymer of isobutylene and 1-butene or 2-butene, or a terpolymer of isobutylene and 1-butene and 2-butene,

wherein the isobutylene derived units are from 40 to 100 wt% of the copolymer, the 1-butene derived units are from 0 to 40 wt% of the copolymer, and the 2-butene derived units are from 0 to 40 wt% of the copolymer.

22. The composition of claim 1 where the polybutene oil has a viscosity of from 10 to 6000 cSt at 100°C.
23. The composition of claim 1 where the polybutene oil has a viscosity of from 35 to 5000 cSt at 100°C.
24. An air barrier comprising the composition of claim 1.
25. The composition of claim 1 further comprising an engineering resin selected from the group consisting of polyamides, polycarbonates, polyesters, polysulfones, polylactones, polyacetals, acrylonitrile-butadiene-styrene resins (ABS), polyphenyleneoxide (PPO), polyphenylene sulfide (PPS), styrene-acrylonitrile resins (SAN), polyimides, styrene maleic anhydride (SMA), aromatic polyketones (PEEK, PEK, and PEKK) and mixtures thereof.
26. A dynamically vulcanized alloy comprising the composition of claim 1 and a polyamide.
27. A composition comprising at least one poly(isobutylene-co-alkylstyrene), carbon black having a surface area of less than 30 m²/g and a dibutylphthalate oil absorption of less than 80 cm³/100 gm; and polybutene oil having a number average molecular weight greater than 400.

28. The composition of claim 27, wherein the poly(isobutylene-co-alkylstyrene) is a halogenated poly(isobutylene-co-*p*-methylstyrene).
29. The composition of claim 27, wherein the poly(isobutylene-co-alkylstyrene) is a halogenated poly(isobutylene-co-*p*-methylstyrene) having a *p*-bromomethylstyrene content of from 0.1 to 5 wt% based on the weight of the copolymer.
30. The composition of claim 27, also comprising a thermoplastic polymer.
31. The composition of claim 27, wherein the polybutene has a number average molecular weight of from 400 to than 10,000.
32. The composition of claim 27, wherein the polybutene is present from 2 to 40 phr.
33. The composition of claim 27, further comprising filler selected from calcium carbonate, clay, mica, silica and silicates, talc, titanium dioxide, starch, wood flower, carbon black having a surface area greater than 30 m²/gm, carbon black having a dibutylphthalate oil absorption of more than 80 cm³/100 gm, and carbon black having a surface area of more than 30 m²/g and a dibutylphthalate oil absorption of more than 80 cm³/100 gm.
34. The composition of claim 27, wherein the composition also includes an exfoliated clay selected from exfoliated natural or synthetic montmorillonite, nontronite, beidellite, volkonskoite, laponite, hectorite, saponite, sauconite, magadite, kenyaite, stevensite, vermiculite, halloysite, aluminate oxides, hydrotalcite, and mixtures thereof.

35. The composition of claim 27 further comprising an engineering resin selected from the group consisting of polyamides, polycarbonates, polyesters, polysulfones, polylactones, polyacetals, acrylonitrile-butadiene-styrene resins (ABS), polyphenyleneoxide (PPO), polyphenylene sulfide (PPS), styrene-acrylonitrile resins (SAN), polyimides, styrene maleic anhydride (SMA), aromatic polyketones (PEEK, PEK, and PEKK) and mixtures thereof.
36. A dynamically vulcanized alloy comprising the composition of claim 27 and a polyamide.
37. A dynamically vulcanized alloy comprising the composition of claim 27 and an engineering resin.
38. An innerliner for a tire comprising the composition of claim 27.
39. An innertube for a tire comprising the composition of claim 27.
40. An air barrier comprising the composition of claim 27.
41. The composition of claim 1, wherein the polybutene has a viscosity of from 10 to 6000 cSt at 100°C.
42. The composition of claim 1, wherein the polybutene is present from 2 to 30 phr.
43. The composition of claim 1, wherein naphthenic oil is substantially absent.
44. A dynamically vulcanized alloy comprising the composition of claim 1 and a polyamide.

45. A dynamically vulcanized alloy comprising the composition of claim 1 and an engineering resin.
46. A composition comprising an elastomer comprising at least 40 mol% isobutylene, carbon black having a surface area of less than 30 m²/g and a dibutylphthalate oil absorption of less than 80 cm³/100 gm; at least one exfoliated clay, and polybutene oil having a number average molecular weight greater than 400.
47. The composition of claim 46, wherein the copolymer is selected from a halogenated poly(isobutylene-co-alkylstyrene), halogenated star-branched butyl rubber, halogenated butyl rubber, butyl rubber, and mixtures thereof.
48. The composition of claim 46, also comprising a thermoplastic polymer.
49. The composition of claim 46, wherein the polybutene has a number average molecular weight between 400 and 10,000.
50. The composition of claim 46, wherein the polybutene is present from 2 to 40 phr.
51. The composition of claim 46, further comprising filler selected from calcium carbonate, clay, mica, silica and silicates, talc, titanium dioxide, starch, wood flower, carbon black having a surface area greater than 30 m²/gm, carbon black having a dibutylphthalate oil absorption of more than 80 cm³/100 gm, and carbon black having a surface area of more than 30 m²/g and a dibutylphthalate oil absorption of more than 80 cm³/100 gm.

52. The composition of claim 46, wherein the exfoliated clay is selected from exfoliated natural or synthetic montmorillonite, nontronite, beidellite, volkonskoite, laponite, hectorite, saponite, sauconite, magadite, kenyaite, stevensite, vermiculite, halloysite, aluminate oxides, hydrotalcite, and mixtures thereof.
53. An innerliner for a tire comprising the composition of claim 46.
54. An innertube for a tire comprising the composition of claim 46.
55. The composition of claim 46, wherein the polybutene has a viscosity of from 10 to 6000 cSt at 100°C.
56. The composition of claim 46, wherein the polybutene has a viscosity of from 35 to 5000 cSt at 100°C.
57. The composition of claim 46, wherein naphthenic oil is substantially absent.
58. An air barrier made by the method of combining: 1) at least one elastomer comprising at least 40 mol% isobutylene, carbon black having a surface area of less than 30 m²/g and a dibutylphthalate oil absorption of less than 80 cm³/100 gm; polybutene oil having a number average molecular weight greater than 400, and at least one cure agent; and 2) curing the combined components.
59. The air barrier of claim 58, wherein the copolymer is selected from a halogenated poly(isobutylene-co-alkylstyrene), halogenated star-branched butyl rubber, halogenated butyl rubber, butyl rubber, and mixtures thereof.

60. The air barrier of claim 58, also comprising a thermoplastic resin.
61. The air barrier of claim 58, wherein the polybutene has a number average molecular weight of from 400 to 10,000.
62. The air barrier of claim 58, wherein the polybutene is present from 2 to 40 phr.
63. The air barrier of claim 58, further comprising filler selected from calcium carbonate, clay, mica, silica and silicates, talc, titanium dioxide, starch, wood flower, carbon black having a surface area greater than 30 m²/gm, carbon black having a dibutylphthalate oil absorption of more than 80 cm³/100 gm, and carbon black having a surface area of more than 30 m²/g and a dibutylphthalate oil absorption of more than 80 cm³/100 gm.
64. The air barrier of claim 58, wherein the composition also includes an exfoliated clay selected from exfoliated natural or synthetic montmorillonite, nontronite, beidellite, volkonskoite, laponite, hectorite, saponite, sauconite, magadite, kenyaite, stevensite, vermiculite, halloysite, aluminate oxides, hydrotalcite, and mixtures thereof.
65. The air barrier of claim 58, wherein the polybutene has a viscosity of from 35 to 5000 cSt at 100°C.
66. The air barrier of claim 58, wherein naphthenic oil is substantially absent.
67. The air barrier of claim 58, wherein the air permeability of the barrier is from 1.2 x 10⁻⁸ to 4 x 10⁻⁸ cm³-cm/cm²-sec-atm at 65°C.

68. The air barrier of claim 58, wherein the polybutene processing oil is a copolymer of isobutylene derived units and 1-butene derived units.
69. The air barrier of claim 58, also comprising a secondary elastomer selected from natural rubbers, polyisoprene rubber, styrene butadiene rubber (SBR), polybutadiene rubber, isoprene butadiene rubber (IBR), styrene-isoprene-butadiene rubber (SIBR), ethylene-propylene rubber, ethylene-propylene-diene rubber (EPDM), polysulfide, nitrile rubber, propylene oxide polymers, star-branched butyl rubber and halogenated star-branched butyl rubber, brominated butyl rubber, chlorinated butyl rubber, star-branched polyisobutylene rubber, star-branched brominated butyl (polyisobutylene/isoprene copolymer) rubber; isobutylene/alkylstyrene copolymers such as isobutylene/meta-bromomethylstyrene, isobutylene/bromomethylstyrene, isobutylene/chloromethylstyrene, halogenated isobutylene cyclopentadiene, and isobutylene/chloromethylstyrene and mixtures thereof.
70. A method to prepare a composition comprising:
combining:
- 1) an elastomer comprising at least 30 mol% of isobutylene;
 - 2) carbon black having a surface area of less than 30 m²/g and a dibutylphthalate oil absorption of less than 80 cm³/100 gm; and
 - 3) polybutene oil having a number average molecular weight greater than 400.

71. A method to prepare a barrier comprising:
- a) combining:
 - 1) an elastomer comprising at least 30 mol% of isobutylene;
 - 2) carbon black having a surface area of less than 30 m²/g and a dibutylphthalate oil absorption of less than 80 cm³/100 gm;
 - 3) polybutene oil having a number average molecular weight greater than 400;
 - 4) a curing agent, and
 - b) curing the composition.
72. A method to prepare a barrier comprising:
- a) combining:
 - 1) an elastomer comprising at least 30 mol% of isobutylene;
 - 2) carbon black having a surface area of less than 30 m²/g and a dibutylphthalate oil absorption of less than 80 cm³/100 gm;
 - 3) polybutene oil having a number average molecular weight greater than 400;
 - 4) optionally, a second elastomer selected from natural rubbers, polyisoprene rubber, styrene butadiene rubber (SBR), polybutadiene rubber, isoprene butadiene rubber (IBR), styrene-isoprene-butadiene rubber (SIBR), ethylene-propylene rubber, ethylene-propylene-diene rubber (EPDM), polysulfide, nitrile rubber, propylene oxide polymers, star-branched butyl rubber and halogenated star-branched butyl rubber, brominated butyl rubber, chlorinated butyl rubber, star-branched polyisobutylene rubber, star-branched brominated butyl (polyisobutylene/isoprene copolymer) rubber; isobutylene/alkylstyrene copolymers

such as isobutylene/meta-bromomethylstyrene, isobutylene/bromomethylstyrene, isobutylene/chloromethylstyrene, halogenated isobutylene cyclopentadiene, and isobutylene/chloromethylstyrene and mixtures thereof.

- 5) filler selected from the group consisting of calcium carbonate, clay, mica, silica and silicates, talc, titanium dioxide, starch, wood flower, carbon black having a surface area greater than 30 m²/gm, carbon black having a dibutylphthalate oil absorption of more than 80 cm³/100 gm, and carbon black having a surface area of more than 30 m²/g and a dibutylphthalate oil absorption of more than 80 cm³/100 gm;
 - 6) optionally, an exfoliated clay selected from exfoliated natural or synthetic montmorillonite, nontronite, beidellite, volkonskoite, laponite, hectorite, saponite, sauconite, magadite, kenyaite, stevensite, vermiculite, halloysite, aluminate oxides, hydrotalcite, and mixtures thereof;
 - 7) optionally, a thermoplastic resin; and
 - 8) a curing agent, and
- b) curing the composition.
73. The method of claim 72, wherein the copolymer is selected from a halogenated poly(isobutylene-co-alkylstyrene), halogenated star-branched butyl rubber, halogenated butyl rubber, butyl rubber, and mixtures thereof.
74. The method of claim 72 wherein the thermoplastic polymer comprises an engineering resin.
75. The composition of claim 1 further comprising paraffinic oil.

- 76. An air barrier comprising the composition of claim 46.
- 77. The composition of claim 1, wherein paraffinic oil is substantially absent.
- 78. The composition of claim 46, wherein paraffinic oil is substantially absent.
- 79. The composition of claim 58, wherein paraffinic oil is substantially absent.
- 80. The composition of claim 1, wherein naphthenic, aliphatic, paraffinic and other aromatic resins and oils are substantially absent.